USB Type-C ENGINEERING CHANGE NOTICE

Title: C2A cable SDC21
Applied to: USB Type-C Specification Release 1.0, August 11, 2014

Brief description of the functional changes:
To add differential to common mode conversion requirement in Table 3-27.

Benefits as a result of the changes:
Differential to common mode conversion is required in legacy USB 3.0 cable. The change will keep the requirement aligned with legacy cable requirement.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
No impact

An analysis of the hardware implications:
No impact

An analysis of the software implications:
N/A

An analysis of the compliance testing implications:
N/A

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Actual Change

(a). Section 3.7.4.2, Table 3-27, Page 86
From Table 3-27:

Items	Descriptions and Procedures	Requirements
Differential Insertion Loss Fit at Nyquist Frequencies (ILfitatNq)	ILfitatNq is evaluated at both the SuperSpeed Gen 1 and Gen 2 Nyquist frequencies.	
Integrated Differential Multi-reflection (IMR)	$$dB\left(\sqrt{\frac{\int_0^{fmax}|ILD(f)|^2|Vin(f)|^2 df}{\int_0^{fmax}|Vin(f)|^2 df}}\right)$$	
Integrated Differential Crosstalk on SuperSpeed (ISSXT)	$$dB\left(\sqrt{\frac{\int_0^{fmax}(|Vin(f)|^2|NEXTs(f)|^2 + |Vdd(f)|^2|NEXTd(f)|^2)df}{\int_0^{fmax}|Vin(f)|^2 df}}\right)$$ where: *NEXTs* = NEXT between SuperSpeed pairs *NEXTd* = NEXT between D+/D− and SuperSpeed pairs *Vdd(f)* = Input pulse spectrum on D+/D− pair, evaluated using equation shown in Figure 3-44 with Tb (UI) = 2.08 ns.	
Integrated Differential Crosstalk on D+/D- (IDDXT)	$$dB\left(\sqrt{\frac{\int_0^{fmax}(|Vin(f)|^2|NEXT(f)|^2 + |Vin(f)|^2|FEXT(f)|^2)df}{\int_0^{fmax}|Vin(f)|^2 df}}\right)$$ where: *NEXT* = Near-end crosstalk from SuperSpeed to D+/D− *FEXT* = Far-end crosstalk from SuperSpeed to D+/D− *fmax* = 7.5 GHz	
Integrated Return Loss (IRL)	$$dB\left(\sqrt{\frac{\int_0^{fmax}|Vin(f)|^2|SDD21(f)|^2(|SDD11(f)|^2 + |SDD22(f)|^2)df}{\int_0^{fmax}|Vin(f)|^2 df}}\right)$$	

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To Table 3-27:

Items	Descriptions and Procedures	Requirements
Differential Insertion Loss Fit at Nyquist Frequencies (ILfitatNq)	ILfitatNq is evaluated at both the SuperSpeed Gen 1 and Gen 2 Nyquist frequencies.	
Integrated Differential Multi-reflection (IMR)	$$dB\left(\sqrt{\frac{\int_0^{fmax}|ILD(f)|^2|Vin(f)|^2df}{\int_0^{fmax}|Vin(f)|^2df}}\right)$$	
Integrated Differential Crosstalk on SuperSpeed (ISSXT)	$$dB\left(\sqrt{\frac{\int_0^{fmax}(|Vin(f)|^2|NEXTs(f)|^2 + |Vdd(f)|^2|NEXTd(f)|^2)df}{\int_0^{fmax}|Vin(f)|^2df}}\right)$$ where: $NEXTs$ = NEXT between SuperSpeed pairs $NEXTd$ = NEXT between D+/D− and SuperSpeed pairs $Vdd(f)$ = Input pulse spectrum on D+/D− pair, evaluated using equation shown in Figure 3-44 with Tb (UI) = 2.08 ns.	
Integrated Differential Crosstalk on D+/D- (IDDXT)	$$dB\left(\sqrt{\frac{\int_0^{fmax}(|Vin(f)|^2|NEXT(f)|^2 + |Vin(f)|^2|FEXT(f)|^2)df}{\int_0^{fmax}|Vin(f)|^2df}}\right)$$ where: $NEXT$ = Near-end crosstalk from SuperSpeed to D+/D− $FEXT$ = Far-end crosstalk from SuperSpeed to D+/D− $fmax$ = 7.5 GHz	
Integrated Return Loss (IRL)	$$dB\left(\sqrt{\frac{\int_0^{fmax}|Vin(f)|^2|SDD21(f)|^2(|SDD11(f)|^2 + |SDD22(f)|^2)df}{\int_0^{fmax}|Vin(f)|^2df}}\right)$$	
Differential to Common Mode Conversion (SCD12 and SCD21)	The differential to common mode conversion is specified to control the injection of common mode noise from the cable assembly into the host or device Frequency range: 100MHz ~ 10.0GHz	$\leq$ -20dB